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Relation between the Tool Database and the CAM System in Designing Operations on a Numerically Controlled Machine Tool

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Abstract—A method is proposed for formulating a tool database with reference to the machine tools and recommended operating conditions at a specific plant. The database may be used to program machining operations in a CAM system.

Keywords: tools, tool database, CAM systems

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In the development of manufacturing under the rubric of Industry 4.0, the focus is on meeting customer requirements. That calls for increase both in the flexibility of production and in productivity, although those goals are often in conflict. In this context, numerically programmed machine tools are widely employed. The requirements of flexible production and productivity may be met by the appropriate combination of single-spindle and multiposition machine tools.

Note, however, that that entails additional time in preproduction, on account of the need to prepare compendious control programs (especially for parts of complex shape).

Fortunately, CAM systems permit automated preparation of control programs. Such systems are most effective within the framework of digital production, with virtual setup, and when using three-dimensional models to solve other preproduction problems [1–4]. This approach calls for the widespread introduction of tool databases.

APPROACHES TO TOOL DATABASES

For various reasons, tools from different manufacturers and suppliers must be used at industrial enterprises. In addition, there will often arise the need for a special tool produced from individualized documentation, whose parameters and shape differ from the standard modeling operations in CAM systems [5, 6]. That considerably expands and complicates the stock of tools employed at the enterprise. In that case, the use of CAM systems imposes special requirements on the organization of tool functions and shapes. In particular, we need three-dimensional models of the tools and the cutting conditions in which they effectively operate.

The websites of major tool producers provide tool databases that may be used in CAM systems. However, their incorporation in the system library may result in a number of errors. The corresponding models are of different scope, and there may be difficulties with identifying the cutting part of the tool, its method of attachment, and so on. These problems complicate tool use in CAM systems.

One option here is to create a database of tool suppliers. In the Teamcenter system, the MRL library is actively employed. However, this system is expensive and is not always suitable for small enterprises. Without employing the Teamcenter system, a different approach to digital production may be adopted in CAM systems.

In the present work, we describe the combination of a tool databases with the Unigraphics NX CAM module. The software employed is Microsoft Access, with built-in VBA programming language. The tool descriptions are taken from the Sandvik Coromant website [7].